Finite toroidal flow generated by resistive wall tearing modes in a toroidal plasma

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Conclusion:

- Numerical investigation using the MARS-Q code shows that an initially unstable tearing mode can intrinsically drive a steady state toroidal plasma flow. In the modelling, the neoclassical toroidal viscosity torque and the resonant electromagnetic torque generated by an unstable tearing mode are included. No external momentum input nor external magnetic field perturbations are assumed in the computation.The saturated toroidal flow is in the order of 17krad/s at the q=2 rational surface in our example.

- The achieved saturated flow is robust against the initial amplitude of the perturbation. Furthermore, saturated flow does depend on the initial (linear) growth rate of the TM, and scales with the plasma resistivity.

- The initially unstable tearing mode can be fully stabilized by the self-generated toroidal flow (and flow shear), as a result of the non-linear interaction between the mode and flow.